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An UWB Antenna for WiMAX and WLAN Applications with Dual Notch- Bands

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***Abstract*— A novel planar ultrawide band (UWB) antenna with double scored groups is proposed and examined. The antenna comprises of a square fix and a changed grounded plane. To figure it out double scored groups attributes, a T-molded stub installed in the square space of the radiation patch and a couple of U-molded parasitic strips close to the food line is utilized. The upside of this antenna is the high dismissal level in the stopband. The deliberate results demonstrate that the proposed double indented groups planar antenna demonstrates a wide transmission capacity from 2.8 to 11.0 GHz characterized by voltage standing wave proportion VSWR<2 , with two indented groups of 3.3-4.0 GHz (WiMAX band) and 5.05–5.90 GHz (WLAN band), separately. Both the exploratory and reenacted aftereffects of the proposed reception apparatus are introduced, showing that the antenna is a great possibility for different UWB applications.**

***Index Terms*— UWB (Ultra Wide Band), Dual Notch- Band, WLAN, WiMAX**

I. INTRODUCTION

I N RECENT years, the expanding requests for reception apparatus with multiband operation in present day remote correspondence frameworks have pulled in much consideration. Specifically, as one of the key segments of the ultrawideband (UWB) framework, to a great degree broadband antenna have been propelled in the recurrence range from 3.1–10.6 GHz, which has drawn the consideration of countless as a result of its preferences of minimal effort, impervious to serious multipath and sticking, and so forth [1]. Of late, various antenna wires with scored band property have been proposed, and different systems have been used to accomplish the capacity.

The generally utilized techniques are carving openings on the patch or on the ground plane, i.e., such H-formed opening [2], U-molded space [3], C-molded opening [4], and so on. Presenting parasitic strips [5] close to the radiation components alternately the ground plane is another approach to make scored groups. Be that as it may, the greater part of the past works have been centered around the single-scored band plan; few works have been concentrated on double scored groups plan. Double indented groups reception apparatuses have been as of late reported [6]–[8]. In these outlines, by embedding the best possible openings in the inside of the radiation component what's more, the ground plane, two rejected groups have been acquired.

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Most of those styles have the common deficiency of poor voltage stationary wave magnitude relation (VSWR) of the twin notched bands. In this letter, a unique UWB planar antenna with twin notched bands is projected. A formed stub within the radiation patch and two formed stubs beside the feeding line square measure wont to notice dual-band-notch \ characteristic. In alternative style, 2 formed stubs square measure wont to succeed a notched band [9], and in our style two formed stubs beside the feeding line square measure 1st employed in the UWB antenna to attain a notched band. The \ parametrical analyses of those filtering structures square measure applied. An antenna prototype is meant and fictitious to demonstrate the proposed strategy. The projected antenna structure is simulated using the Ansoft High Frequency Structure machine (HFSS), one industrial 3D full-wave magnetic attraction simulation software. The simulation and measure each indicate twin bands rejection with central frequencies of three.6 and 5.5 GHz, respectively, and glorious notched band characteristics.

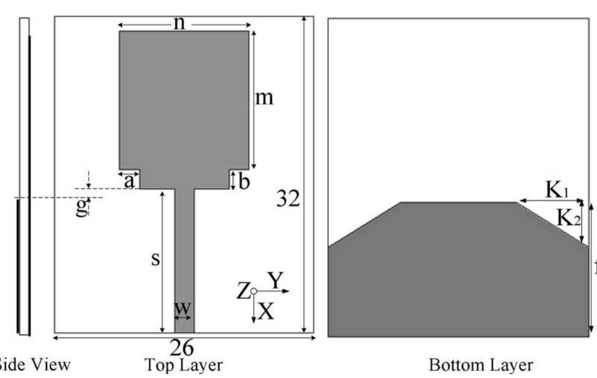

Figure1: Configuration and parameters of the UWB antenna

II. ANTENNA DESIGN AND RESULTS

A. UWB Monopole Antenna

Figure 1 shows the geometry of a UWB monopole antenna. The antenna is fabricated on Rogers4003 substrate with dielectric constant of 3.38 and thickness of 0.8 mm. The antenna and feeding line are printed on the top side of the substrate and the ground plane on the bottom side. The width of the microstrip feed line is chosen as 2 mm to achieve the characteristic impedance of 50 . The dimensions of the designed antenna after optimization are as follows: a =2mm, b= 2 mm, s= 14.5mm, f= 13.5 mm, m=14 mm, n= 13 mm, g = 1mm, k1= 8mm, k2= 5.5mm.

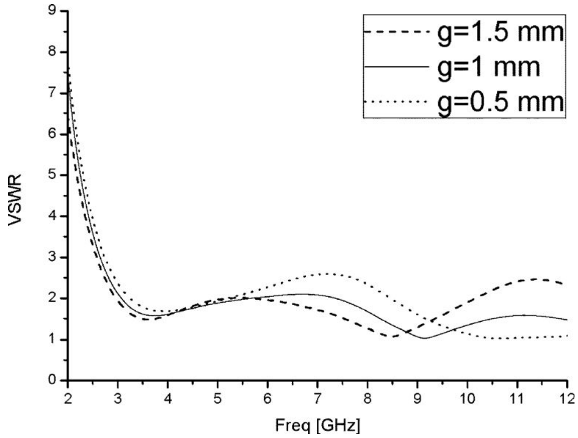

Figure 2: Simulated VSWR of the proposed antenna without notched bands in case of different g .

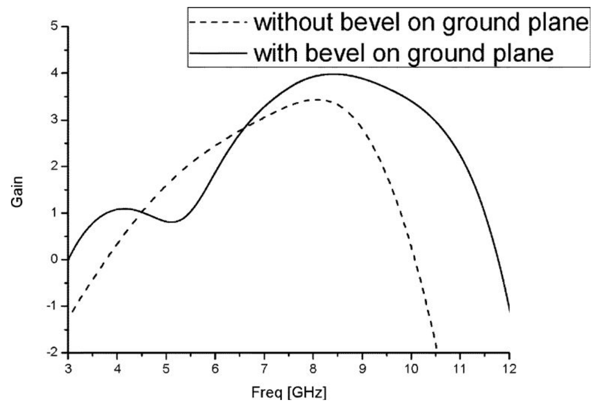

Figure 3: Simulated gain of the UWB antenna with and without bevel on the ground plane.

In the presented design, the monopole antenna and the ground plane form an equivalent dipole antenna [9]. The current distribution on the patch affects the impedance characteristics of the antenna. By cutting the two notches of suitable dimensions at the two lower corners of the patch, it is the same with [10] that the impedance bandwidth can be much enhanced. This phenomenon occurs because the two notches affect the electromagnetic coupling between the rectangular patch and the ground plane.

The gap between the radiation patch and ground plane is denoted as , which is also an important parameter to control the impedance bandwidth, as shown in Fig. 2. The patch and the ground plane form an equivalent dipole antenna. The ground plane is beveled, resulting in a smooth transition from one resonant mode to another and ensuring good impedance match and stable gain over a broad frequency range. The gains of the antenna with and without bevel on the ground plane are shown in Fig. 3. The proposed antenna can achieve high gain at low and high frequency with bevel on the ground plane.

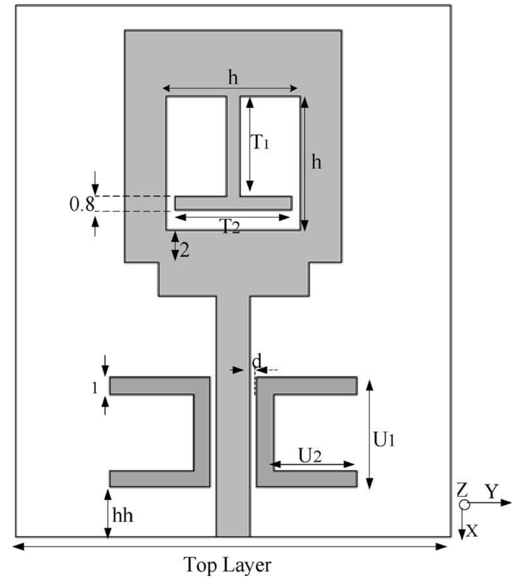

Figure 4: Configuration and parameters of the UWB antenna with dual notched bands.

B. *UWB Monopole Antenna With Two Notched Bands*

To achieve dual notched bands, a T-shaped stub on the radiating patch and a pair of U-shaped stubs near the feeding line are adopted to generate notched bands with central frequencies of 3.6 and 5.5 GHz, respectively. The configuration is shown in Fig. 4.

The simulated current distributions of the UWB antenna at the notched frequencies are shown in Fig. 5(a) and (b).We may note that the currents are mainly distributed around the filter structures and oppositely directed between the interior and exterior edges. Therefore, the resultant radiation fields can be canceled out, and high attenuation near the resonant frequency is achieved, thus resulting in notched band.

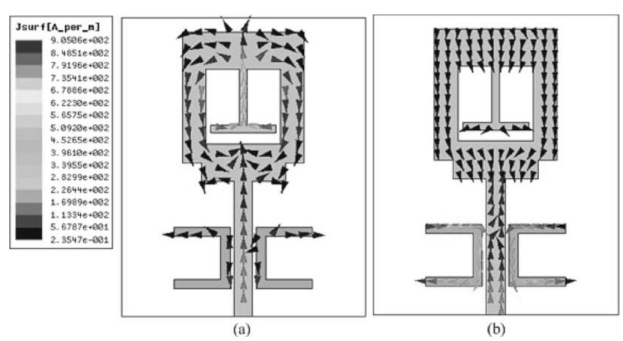

Figure 5: Simulated current distributions at different notch frequencies. (a) 3.5 GHz.(b) 5.5 GHz.

To further investigate the design of the proposed antenna, some parametric studies are carried out next. The notched performances are mainly determined by T1, T2, U1, and U2. The first notch band is mainly decided by the dimension of T-shaped stub. Figs. 6 and 7 show the simulated band-rejecting characteristics of the antenna in cases of different T1 and T2, respectively.

Obviously, the frequency shifts from around 3.07 to 3.77 GHz when T1 changes from 6.5 to 5.5 mm, while the frequency shifts from around 3.36 to 3.71 GHz when T2 from 7.5 to 6.5 mm

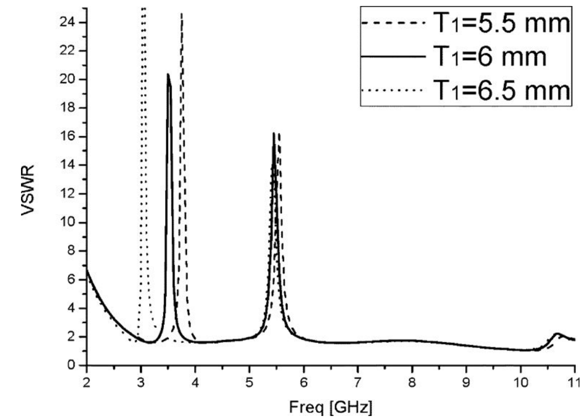

Figure 6: Simulated band-rejection characteristics of the proposed antenna with dual notched bands in case of different T1.

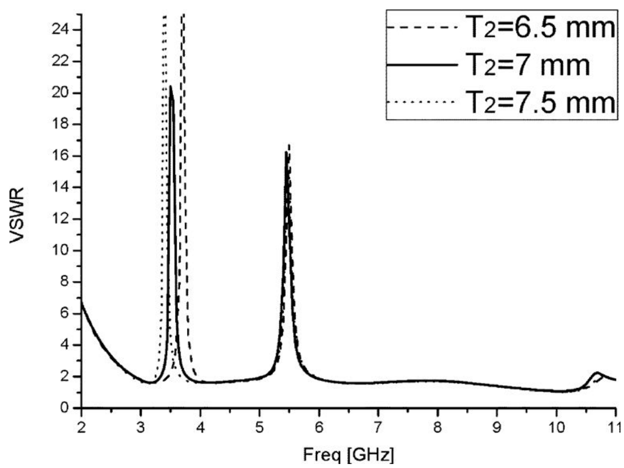

Figure 7: Simulated band-rejection characteristics of the proposed antenna with dual notched bands in case of different T2 .

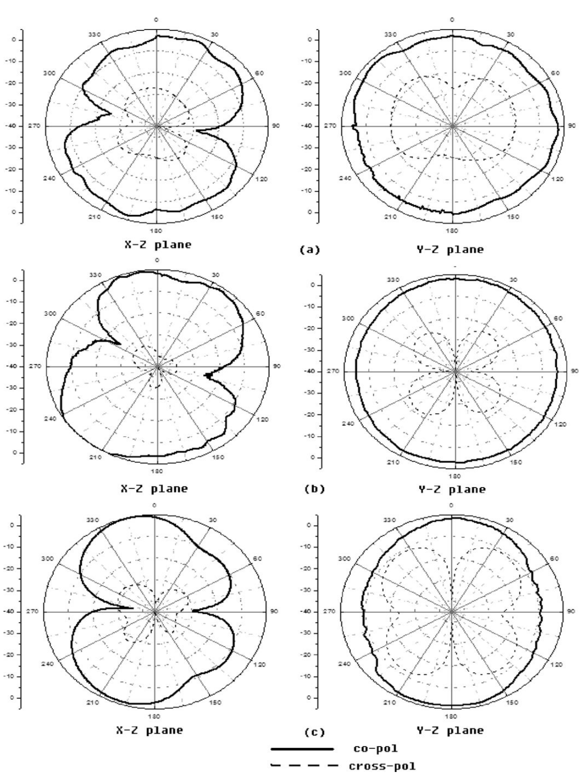

Figure 8: Measured radiation patterns at three frequencies. (a) 3.1 GHz.
s(b) 6.5 GHz. (c) 9 GHz.

The radiation patterns of the proposed antenna were measured in an anechoic chamber. The measured far-field radiation patterns of the proposed dual-band-notched antenna in the E-plane and H-plane at the frequencies of 3.1, 6.5, and 9 GHz are plotted in Fig. 8. It can be seen that the radiation patterns in the yz-plane are nearly omnidirectional, but more directive in the higher band.

III CONCLUSION

In this letter, a novel compact printed antenna with dual-band notched characteristics used for UWB applications has been presented and investigated. Adjusting the gap between the radiation patch and ground plane, a wide impedance bandwidth is achieved. By introducing a T-shaped stub in the radiation patch and a pair of U-shaped parasitic elements beside the feed line, dual stopbands for applications of WiMAX and WLAN are created.

The radiation pattern of this antenna shows good omnidirectional performance throughout the UWB frequency range and constant gain in the UWB band is realized. Accordingly, the proposed antenna is expected to be a good candidate in various UWB systems.

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